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Susan Robinette
Permits Unit Manager
Water Quality Control Division
Colo. Dept. of Public Health & Environment
4300 Cherry Creek Drive South
Denver, CO 80246-1530

Subject: Draft Surface Water Quality Sampling and Analysis Plan Rico Colorado

Dear Ms. Robinette:

On behalf of Atlantic Richfield Company and at the direction of Chuck Stilwell, we are providing herewith three copies of the Draft Sampling and Analysis Plan for Surface Water Quality Monitoring, Rico Colorado. We are also forwarding an additional copy to Sheldon Muller for distribution to Carol Russell and to Bill Duffy for distribution to Marcus Martin.

Sincerely,

William R. Kelly, P.E.
Project Manager

cc: Chuck Stilwell (Atlantic Richfield)
Lee Hanley (EPA)
Tony Trumbly (Colo)
Sheldon Muller (EPA) W/copy for Carol Russell
Alan Au (BP America)
Bill Duffy (DGS) W/copy for Marcus Martin
Mark Walker (Colo. Dept. of Public Health & Environment)
Eric Heil (Rico)
Ramon Escure

DRAFT
SAMPLING AND ANALYSIS PLAN FOR SURFACE WATER QUALITY MONITORING RICO COLORADO

1.0 Introduction

This plan includes surface water and mine adit water quality sampling and flow measurement activities within the Silver Creek and upper Dolores River basins near the Town of Rico, Colorado. The sampling locations and parameters for analysis have been selected to provide relevant data on the St. Louis tunnel discharge, the St. Louis settling pond system discharge (002), Argentine Tailings seep, an unnamed adit along Silver Creek (downstream of the overhead tramway), Silver Swan adit discharge, combined Rico Boy and Santa Cruz adit discharges, Columbia Tailings seep, Silver Creek, and the Dolores River. Water flow measurements will be performed at each sampling site in conjunction with the water quality sampling. Table 1 lists the sampling station locations and site descriptions.

2.0 Sampling Objectives/Frequency

The data from the water samples will be used to characterize the water quality of the seeps, adit drainages and receiving streams. An objective of sampling is to collect samples during seasonal low-flow periods.

Sampling Frequency: Two periods for water quality compliance at the St Louis Ponds system are being proposed. One period is during the high flow season defined as April 1 through October 31 and the other is during the low flow season from November 1 through March 31. Two samples will be collected annually, with one collected during each of the two periods identified above. The intention is, within practical limitations, to sample during each period concurrent with the minimum flow in the Dolores River for that period. Generally, it is anticipated that the high flow season will be sampled after the spring runoff, with the minimum flow anticipated in September. The winter period may have to be sampled in late October/early November to avoid inaccessibility due to frozen conditions. River flow/runoff at the Dolores River gaging station will be reviewed in an attempt to schedule sampling during minimum/low flow periods.

3.0 Water Quality and Flow Measurement Sampling Locations

Samples will be collected from the St. Louis tunnel discharge, the St. Louis settling pond system discharge, Argentine Tailings seep, Silver Swan adit discharge, combined Rico Boy and Santa Cruz adit discharges, Columbia Tailings seep, the unnamed adit along Silver Creek downstream of the Argentine Tailings (downstream of the overhead tramway, for future reference identified as "Tramway Discharge"), Silver Creek, and the Dolores River as shown in Table 1. Samples will be collected starting with the most downstream site and progressing upstream. The Blaine adit will be observed to maintain documentation of its zero discharge status.

The Dolores River will be sampled above the St. Louis Pond system, and below all adit outfalls, (just downstream of the Silver Swan adit). It will also be sampled below the pond system discharge (above the confluence with Silver Creek) and above the Columbia Tailings (below the confluence with Silver Creek). Silver Creek will be sampled above the Blaine adit (above all mining

activities) and above the confluence with the Dolores River. Flow measurements will be taken at all locations where water quality samples are collected.

TABLE 1

Sampling Location Summary

SITE ID	SITE DESCRIPTION
SC-2	Blaine adit - observe and document discharge status
SVS-1	Silver Creek above the Blaine adit (below Town of Rico diversion)
SVS-12	Argentine Tailings seep at source
SVS-20	Silver Creek just above confluence with Dolores River
SVS-26	Tramway Discharge (unnamed adit along Silver Creek, downstream of overhead tramway)
DR-1-SW	Dolores River side channel/Columbia Tailings seep
DR-2-SW	Dolores River above Columbia Tailings (below Silver Creek)
DR-4-SW	Dolores River below Silver Swan
DR-7-SW	Silver Swan adit
DR-9-SW	Rico Boy/Santa Cruz combined-flow pond outlet
DR-1	Dolores River above St. Louis settling pond system
DR-3	St. Louis Tunnel discharge at adit
DR-6	St. Louis settling pond system outfall to the Dolores River (Outfall 002)
DR-7	Dolores River below St. Louis settling pond system outfall
DR-27	Rico Boy/Santa Cruz combined flow (just downstream of juncture)

4.0 Sampling and Analysis Parameters and Methods

Water samples will be analyzed for pH, temperature, conductivity, alkalinity, hardness, total dissolved solids (TDS), total suspended solids (TSS), plus the trace metals cadmium, copper, cyanide, iron, lead, manganese, nickel, and zinc depending on location as described below.

The following parameters/analysis will be completed at the various sites:

- Cadmium, Copper, Manganese, and Zinc – dissolved at all sampling stations, plus total recoverable at the St Louis adit and potentially dissolved at the pond system discharge
- Cyanide - WAD in the Dolores River above and below the St Louis Ponds
- Iron – total recoverable at all sampling stations, and dissolved at the St Louis adit and pond system discharge
- Lead, and Nickel, – dissolved and potentially dissolved at the St Louis adit and pond system discharge, dissolved above and below the ponds

Sampling will be conducted in accordance with the sampling program used for the Rico site remediation. Lab-certified plastic bottles will be used to collect sample water for hardness, TDS, and TSS analyses. Sample water for dissolved metals analysis will be first collected in a clean plastic bottle, and within ten minutes, filtered through a 0.45µm filter into a sample bottle containing nitric acid preservative. Sample water for total recoverable metals analysis will be collected without filtration in a sample bottle containing nitric acid preservative. Sample water for potentially

dissolved metals analysis will be collected without filtration in a sample bottle containing nitric acid preservative. For quality control purposes, one duplicate sample and one field blank will be included in addition to the water samples being submitted to the laboratory for analysis.

Field parameters will be measured at the time of sample collection. Field measurement data for pH, temperature, conductivity, and alkalinity will be recorded in a logbook and on sample collection forms. Field instruments will be calibrated each morning using standard solutions and consistent with manufacture's instructions. Weather parameters including temperature and precipitation will be obtained and recorded in the logbook.

All sample bottles will be labeled to identify sample number, date and time of collection, type of analysis, and appropriate preservative. In addition, sample analysis/chain of custody forms will be completed and processed at the time of sample collection. Original chain of custody forms will be signed, dated, and placed in the sample shipment container prior to sealing the container for shipment.

All water samples will placed in a cooled container and sent to the analytical laboratory. Sample analyses will be performed according to methods specified in 40 CFR, Part 136 or other methods approved by EPA. Laboratory methods and reporting limits for all parameters are presented in Table 2. Laboratory results will be supported by sufficient backup data and quality assurance results to enable reviewers to conclusively determine the quality of the data. The analytical report package will include reference to the analytical methods used, detection limits, and quality control data.

5.0 Flow Measurement Methods

Discharge measurements will be conducted in accordance with the measurement procedures used for the Rico site remediation as well as USGS standard discharge measurement procedures. Flows will be measured by one of three methods (1) a Marsh-McBirney Model 2000 portable flow meter, (2) Parshall flume, or (3) volumetric procedure using a 5-gallon bucket.

The six-tenths-depth method (for depths between 0.3 feet and 2.5 feet) was selected for the flow meter measurements. This method uses the velocity at six-tenths of the depth as the mean velocity in the vertical direction. This method is generally reliable between depths from 0.3 feet to 2.5 feet. The first step in the measurement procedure is to select a stream section with the desired characteristics of: parallel flows, smooth streambed with minimal obstructions, a straight channel, and a flat streambed. The best possible section will be selected using these criteria. After selecting the stream section, a measuring tape will be stretched across the stream section, perpendicular to the flow, and anchored at both ends. The width of the section will be determined and divided into several (10 to 20) vertical sections. Flow measurements of velocity (by the six-tenths-depth method) and water depth will be measured at each vertical section using the Marsh-McBirney flow meter and wading rod assembly. The flow meter will be set to the 10 second fixed period average mode. Three velocity readings will be recorded at each vertical section. Flows will be calculated for each stream section using the water depth, horizontal distance, and averaged velocity data. The flow meter measurements will be recorded in a logbook and the discharges calculated in the office.

The Argentine Seep, St. Louis adit flow, and St. Louis Pond discharge 002 each have a Parshall flume installed. Water depth measurements will be taken at the appropriate location in the flume. This water depth will then be used to read the flow rate from a flume-rating table.

The volumetric procedure will be used at the Silver Swan adit, the combined Rico Boy/Santa Cruz flow, the Rico Boy/Santa Cruz wetland outlet, and the Tramway Discharge. Volumetric field measurements consist of leaving a 5-gallon bucket under each test cell discharge for a length of time and measuring the water depth in the bucket at the end of the time. The volumetric trials will be averaged to determine the flow rate (in gallons per minute) at each station. The volumetric trials will be recorded in a logbook.

TABLE 2
Analytical Procedures Summary

Parameter	Detection Limit (MDL)	Method
Field Parameters		
pH (s.u.)	- - -	EPA 150.1
Temperature (°C)	- - -	Standard Method 2550
Conductivity (µmhos/cm)	- - -	EPA 120.1
Alkalinity (mg/L as $CaCO_3$)	1 mg/L	EPA 310.1
General Parameters		
Hardness (mg/L as $CaCO_3$)	1 mg/L	SM 2340 B
Total Dissolved Solids (mg/L as TDS)	10 mg/L	M 160.2 Gravimetric
Total Suspended Solids (mg/L as TSS)	5 mg/L	M 160.2 Gravimetric
Trace Metals		
Cadmium (µg/L as Cd)	3 µg/L	M 200.7 ICP
Copper (µg/L as Cu)	1 µg/L	M 200.8 ICP - MS
Cyanide (µg/L as CN)	5-10 µg/L	Low-level WAD
Iron (µg/L as Fe)	10 µg/L	M 200.7 ICP
Lead (µg/L as Pb)	0.2 µg/L	M 200.8 ICP - MS
Manganese (µg/L as Mn)	5 µg/L	M 200.7 ICP
Nickel (µg/L as Ni)	10 µg/L	M 200.7 ICP
Zinc (µg/L as Zn)	10 µg/L	M 200.7 ICP

6.0 Report

Water quality and flow measurement results will be provided in a brief summary report. The report will present the collected data in a summary table format. Sampling, analysis, measurement, and quality control information will be briefly summarized for easy reference. Copies of field notes, sample collection forms, and analytical reports will be included in the report as appendices.